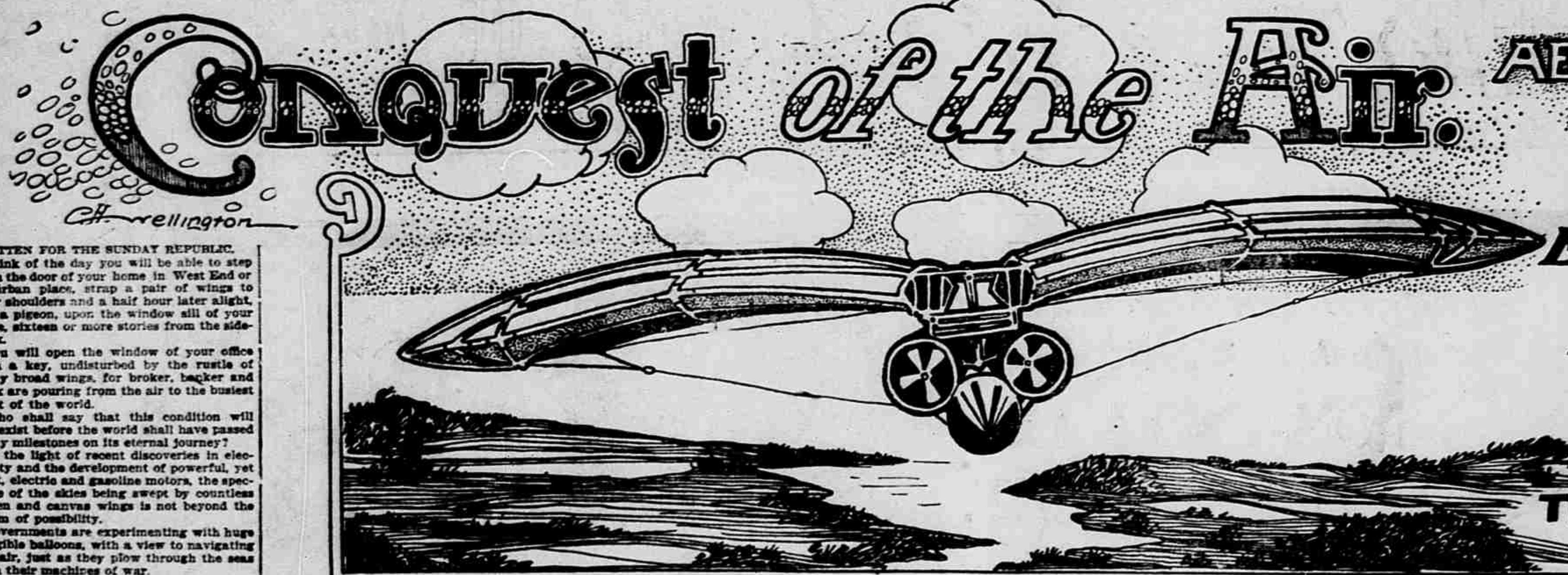
Conquest of the Air.

AEROPLANE VS. BALLOON

LANGLEY'S EXPERIMENT

ENGINEER BESKOW'S AIRSHIP

THE LESSON OF THE KITE.



WRITTEN FOR THE SUNDAY REPUBLIC.

Think of the day you will be able to step from the door of your home in West End or suburban place, strap a pair of wings to your shoulders and a half hour later alight, like a pigeon, upon the window sill of your office, sixteen or more stories from the sidewalk.

You will open the window of your office with a key, undisturbed by the rustle of many broad wings, for broker, banker and clerk are pouring from the air to the busiest mart of the world.

Who shall say that this condition will not exist before the world shall have passed many milestones on its eternal journey?

In the light of recent discoveries in electricity and the development of powerful, yet light, electric and gasoline motors, the spectacle of the skies being swept by countless silken and canvas wings is not beyond the realm of possibility.

Governments are experimenting with huge dirigible balloons, with a view to navigating the air, just as they plow through the seas with their machines of war.

In the construction of the airship that will become practical there is yet a decision to be reached.

Will the flying machine of the future comprise a silken bag filled with gas and a motor to drive it on its course, or will the theory of generations that if men live above the earth they must do so with the aid of wings, as fly all birds, determine the conclusion of this problem?

Must the air car be heavier or lighter than the air?

Scientists of many countries are more active and determined in their experiments to-day to solve the puzzle of aerial locomotion than ever before.

The success of Santos-Dumont in Paris with his numerous balloons, which obeyed his will in many trying voyages, has set many minds to working upon this problem, and hardly a week passes in which there is not advanced some new theory.

The possibilities of a navigable vessel of the air, not only as a means of national defense, but to serve commercial interests, cannot be foretold.

The evolution of kites has solved many a vexing problem, as W. R. Kimball explains in an accompanying article. There are many active minds engaged along this line.

AIRSHIP CONTEST
AT THE WORLD'S FAIR.

Next summer at the Louisiana Purchase Exposition airship and aeroplane will contest for $100,000 in prizes.

The contestants will represent several countries.

Many models of these ships, now held in secret in several parts of the world, will be embodied in huge balloons and flying ships.

Professor S. P. Langley, down on the Potomac, has been sending a great winged machine through the air at terrific speed. This scientist has, as yet, failed to divulge the secret of his machine, only meager reports and less accurate descriptions coming from the isolated section in which the professor and his associates were at work.

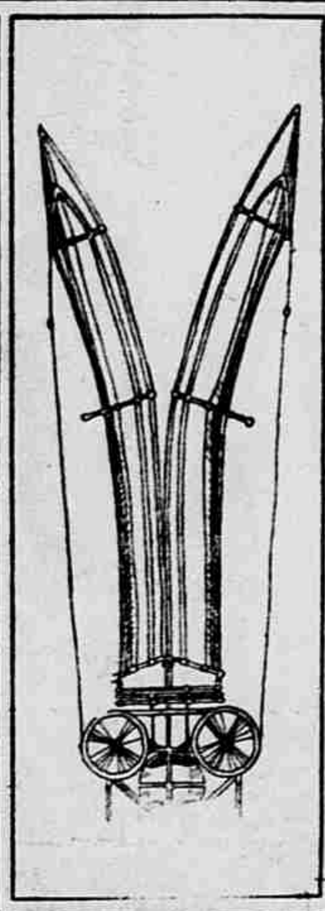
A newcomer in the field of airship construction is Bernard Beskow, a civil engineer, residing in New York.

From the plans of the invention with which Mr. Beskow intends to compete for the rich prizes at St. Louis, this airship is a distinct departure from models that have been shown.

It is an aeroplane much after the appearance of the machines with which successful flights have been made, but he combines wings and the use of gas in an ingenious manner.

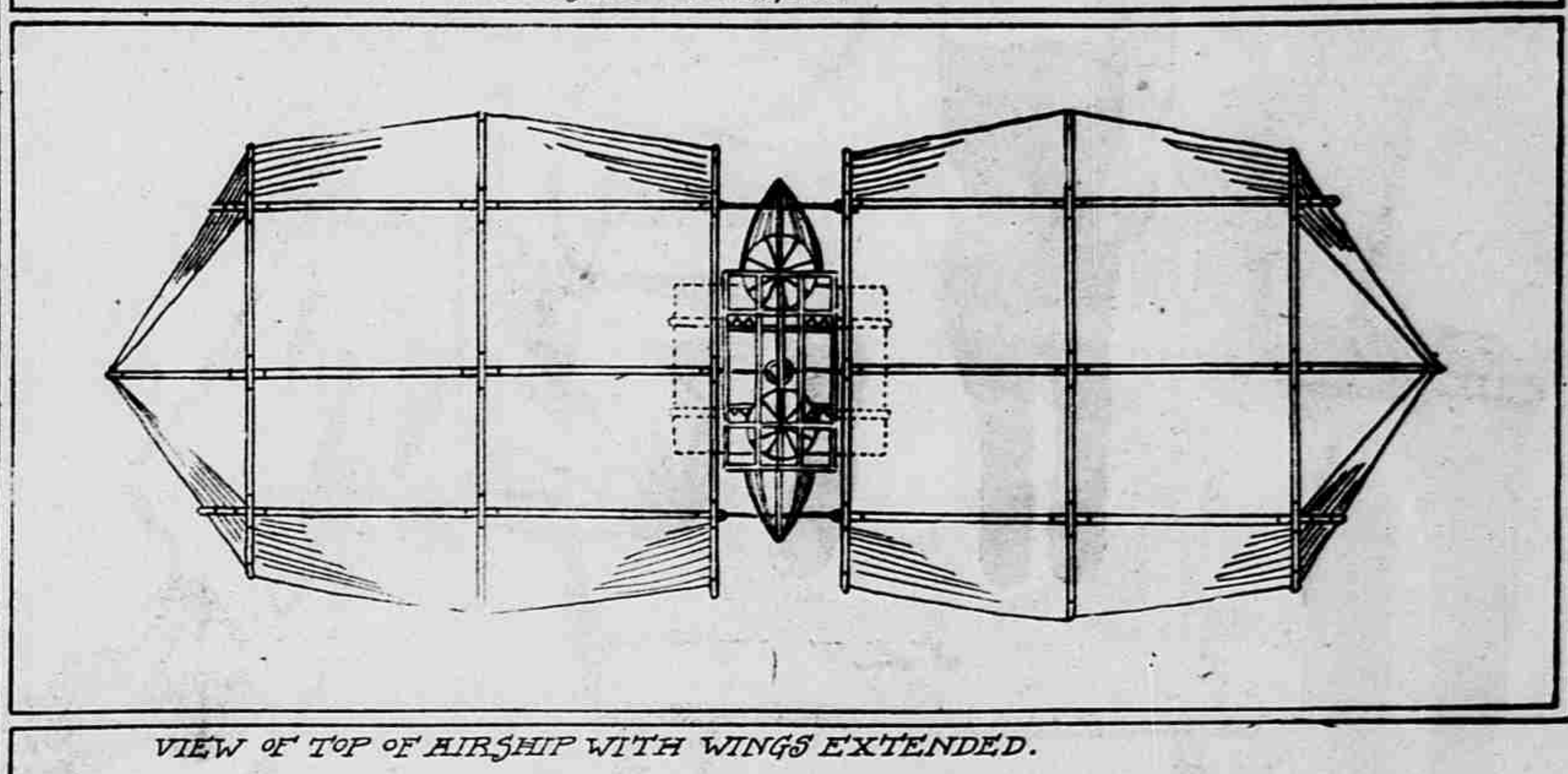
Mr. Beskow makes the bold statement that his aeroplane will fly and that he intends to sail it above the housetops of New York before many moons have passed.

The inventor does not seek to hide any of the details. He tells the story of his ship in plain words.



FRONT VIEW OF AIRSHIP WITH WINGS ELEVATED.

FRONT VIEW OF AIRSHIP IN FLIGHT.



VIEW OF TOP OF AIRSHIP WITH WINGS EXTENDED.

MY AEROPLANE AIRSHIP WILL FLY.

By BERNARD BESKOW.

My ship will fly.

I will sail it over New York, and at the World's Fair at St. Louis I shall make a great endeavor to win the prize.

The principal object of this invention is to provide means by which the supporting surface of the aeroplane can be easily varied to suit different purposes, as, for instance, to offer the slightest possible resistance to the air when the ship is in action and to give the largest possible supporting area when the ship is floating in the air.

A further object is to provide the airship with a practical and effective steering apparatus and means by which to operate the same.

The framework for the aeroplane will be strong, and it must be to support the forward impelling and steering apparatus.

I will make one point emphatic before I go any further.

The direct ascension of my airship, although "heavier than the air" when under full flight, is accomplished by discharging a certain weight, this making the airship "lighter than the air" at the moment of ascending.

The weight discharged is attached to the body of the ship by means of wire ropes, and these weights are suspended at equal distance from the center, so as not to disturb the equilibrium of the ship when they are loaded or unloaded.

When the ship rises the screw propellers are able to find undisturbed columns of air against which a pressure can be exerted.

The weights are then taken aboard the ship, which is now "heavier than the air."

It is now a huge kite sustained in the air on the same principle as the kite—i. e., the relative velocity between the aeroplane and the air and the pressure of the wind against the aeroplanes is used to sustain the dead weight of the airship.

HIS ARGUMENT
AGAINST THE BALLOON.

My argument against the balloon in its present state is that it presents an immense surface to the wind and is easily swerved from its course unless the current of air is dead ahead.

The aeroplane constructed on the lines of the wings of a bird offers little resistance from any direction and enables the aeronaut to navigate the air more or less in the manner of a sailing vessel.

My airship combines the virtues of the aeroplane and the balloon.

Why? you ask. The wings of my machine are filled with gas.

The body is hollow, a cigar-shaped structure with cells for the gas, which would not be noticed when the big machine is sailing through the air.

But it is a help in sustaining the mighty vessel.

As far as I have studied there has always been some difficulty in arranging for the return of the aeroplane to terra firma. How can danger be avoided? When an airship settles to the earth it must be done gradually.

My aeroplane is so constructed that with the folding of the wings the big ship will settle prettily and with hardly a jar.

The aeroplanes, you must know, fold compactly and at the direction of the man who controls the machine.

I claim many new features for my ship. Here are some of them:

The aeroplane being heavier than the air, and without having large surfaces exposed to the action of the wind, it will escape the buffeting accorded a balloon in the wind.

Its stability is the best, as the center of gravity is as low down as possible.

The action of the wind upon the aeroplanes is similar to the effect suffered by a bird in its flight—i. e., the aeronaut can direct my machine against the strongest wind, and by means of the deflection of the aeroplanes can descend and ascend according to will.

Direct ascension is possible, no previous running of the flying machine being necessary.

NO DANGER OF
AN ACCIDENT.

There is no danger of accident in case of a break in the machinery of the motor or in case of a puncture or leak in the gas-holding cells, as the dimensions of the aeroplanes are sufficiently great to counteract the gravity of the dead weight and to allow the airship to descend quietly to the ground.

No cast-out filling and refilling of the gas cells is necessary. Safety valves are provided to prevent the bursting of the cells.

The folding of the aeroplane enables the aeronaut to descend as rapidly as he desires and with safety.

The complete collapse of the aeroplanes reduces the space occupied by the machine when it is eased.

Here are the dimensions of my aeroplane:

Length, 50 feet; width, 40 feet; depth, 5 feet.

Body or ship—Length, 28 feet; diameter, 7 feet.

Screw propellers, 6 feet; pitch, 11 feet.

Net area of each propeller, 27 square feet.

Revolutions per minute, 1,000.

Supporting surface of both aeroplanes, 3,264 feet.

Engine, thirty horse power.

KITE FORETELLS SUCCESS OF AIRSHIP

By WILBUR R. KIMBLE.

From a laboratory point of view, the problem of aerial locomotion is solved.

The most convenient forms of aeroplane are the various types of tailless kites brought to a high state of perfection in the last few years.

The commendable work of the Weather Bureau in 1896 marked an epoch in the development of the kite and gave a strong impetus to scientific research in this direction.

The statement by Professor Bell to the effect that a successful airship will behave as a kite when anchored to the earth, and conversely, and that an efficient kite will serve as a model for an airship, bids fair to be realized.

The thinkers devoted to this subject have practically come to the conclusion that the commercial successful airship will have no gasbag, and that it will, in fact, be heavier than the weight of air displaced.

They recognize in the improved tailless kite an airship pure and simple, that only awaits the attachment of a suitable motor.

The various successful devices for soaring or sailing are in reality a reproduction of a portion of a kite surface.

It will be observed that ordinary kites develop notable features. First, the center of gravity rises from some point in the string to a point somewhere within the space circumscribed by the outlines of the kite's framework, whether single plane or multicellular.

The apparatus will then be more sensitive than before, but when balanced its swaying and diving proclivities will for the most part disappear.

Making use of the parallelogram of forces of mechanics and applying it to the distribution of pressure about the surface of a kite furnish a simple and accurate method of studying kite phenomena. (Fig. 2.)

Allowing the two adjacent sides of the parallelogram to stand for the horizontal pull and the vertical lift, it will be found that the line of motion will be along the diagonal in direct line with the kite string.

Dropping into the technique of the subject, the horizontal pull, or thrust, in the case of an airship we will call the "drift," and the vertical lifting force the "lift."

The ratio of the two to each other will express the true efficiency of the apparatus at a constant speed.

DIAGONAL OF THE
JOINT FORCES.

As the diagonal of the joint forces always meets the kite surface at right angles to the surface at that point, the parallelogram may be drawn at any time by letting fall a perpendicular from the junction of the diagonal and the kite surface and extending a horizontal from the same point at right angles to the perpendicular.

Right lines from this horizontal and perpendicular to a second point lower down on the diagonal will complete the figure. (Fig. 3.)

The horizontal line will mark the angle of incidence of the air current with the kite surface, and the smaller the angle of incidence the greater the lift in proportion to the drift and the higher the efficiency of the machine.

It is obvious from the foregoing that the string will take up a position representing the diagonal of the parallelogram of forces, the horizontal component of which stands for the pressure of the air current and the vertical for the relative weight of the kite and its load.

The nearer an absolutely vertical position is reached and maintained by the kite line the greater the difference between the lift and the drift and the higher the efficiency of the kite running free.

While an increasing load lowers the efficiency of the lift, it may be restored by a comparatively small increase in speed, increased speed within wide limits increases the leverage efficiency, and also increases the ratio of "lift" to "drift," and lessens the necessary area of sustaining surface as the square root of the velocity in feet per minute.

The power required to drive the apparatus increases as the cube of the speed, and hence for high speeds the weight of the motor in pounds per horse power per second becomes the most important factor.

It is here shown that as the speed decreases the weight of the motor may be increased till the ordinary commercial types of gasoline or steam motors, weighing twenty to fifty pounds per horse power, become available.

As the "drift" and the "lift" correspond to the sine and cosine of an arc, it follows that for an angle of fourteen degrees from the vertical the ratio of the "drift" to the "lift" would be roughly 24 to 97, or one to four and a leverage of 75 per cent.

POUND PULL WOULD
SUPPORT THE KITE.

In other words, were the kite line to be divided into two strands and one carried forward to a horizontal position, a pull of one pound on this line would support the kite and added load sufficient to make up four pounds dropped vertically from the other half of the divided kite line.

When the kite line is released to a distance of forty feet or more it begins to assume the form of a catenary under the influence of the force of gravity and the pressure of the air currents.

The curve deepens with increasing length of line till the angle of the line no longer bears much relation to the efficiency of the kite itself.

Deductions from these data are of considerable importance, because they demonstrate that a pressure or a pull of one pound properly applied will hold six pounds or more in the air.

The principle involved is analogous to that in a lever of the second class.

When weights are added and the kite is made to do work phenomena appear somewhat different from those when it flies free, mainly because of the formation of a new center of gravity at an increased distance from the center of pressure, which greatly increases the stability of the apparatus.

For developing the greatest lifting power in the kite the load should be arranged at a point directly in line with the flying string.

Apparently the most stable point in conjunction with high efficiency is where the kite string is fastened to the hanger.

Supposing the hanger to be properly arranged and adjusted, the movement of the load toward the rear tends to lower that end and throw the forward end upward, thus increasing the area of the sustaining surface exposed to the action of the air, resulting, however, in a loss of lifting efficiency, unless the wind speed is increased to restore the original angle of incidence.

With a lessening of the speed of the current the body of the kite drops backward, as shown in figure 7, until sufficient cross section of the wind stream is covered to re-establish equilibrium.

This kite is therefore automatic in a large degree.

The pressure against the kite surface varies directly with the area of the cross section of the stream of air deflected and with the square of the velocity of the wind or speed of the kite through the air.

It is evident that if the kite is advancing through the air its speed should be added to the wind speed and deducted if losing ground.

When the load is carried forward of the center of air pressure the lift tilts the kite forward, spilling some of the wind, and with the lessened support the apparatus, properly balanced, will start off down an inclined plane of air on a journey back to earth and against the wind.

MANEUVER MAY BE
REPEATED AT WILL.

This maneuver may be repeated at will by a simple rigging, which consists of a pulley attached to the hanger at the point where the string is usually fastened and then running the kite string from the forward tip of the kite down through the pulley to the operator.

The weight, of about twenty ounces for a six-foot kite, varying somewhat with the strength of the wind, should be fastened to the new or second hanger a distance of six or eight inches from the pulley and sufficiently far from the kite tip to leave a little slack when the weight is drawn up to the pulley.

It will be readily understood that as long as the tension necessary to hold the kite in the air is maintained on the kite string the weight will be held closely to the pulley, when, all the forces being in equilibrium, the apparatus seeks and holds a position at the greatest altitude permissible by the length of line and the general efficiency.

With the kite well up in the air a quick release of the tension on the line lets the weight fall forward and away from the pulley by force of gravity a distance gauged by a knot in the string.

The shifting of the load thus forward turns the kite into an airship, sailing forward with the flying line slack and under its own steam, the kinetic energy stored when the kite and weight were raised aloft.

In this instance the weight of the kite was seventeen ounces and the load was of iron and lead weighing nineteen ounces, or a total of two and a quarter pounds.

If, now, a third hanger is fastened to one tip at the side of the kite, the other end of the string tied to the weight in such a manner as to divide the load when the tension is released on the main line, the weight will swing to the side, as well as forward, and the kite will circle to the right or left, according to the position of the weight, making many turns in its spiral path before reaching the earth.

When balanced in the air by a strong breeze and the angle of incidence reduced till the flying line assumed a horizontal position, thus measuring the "drift," the pull on the string dropped upon one occasion as low as six ounces, with a total weight of thirty-six ounces. The ratio of "lift" to "drift" in this instance was six to one.

RECENTLY COMPLETED
SANTOS-DUMONT NO. 9.

The latest data on this subject refer to the little Santos-Dumont No. 9, recently completed and successfully operated in Paris.

The most interesting point for the purposes of the present discussion is that an air thrust of about sixty-five pounds was obtained with a three-horse-power motor, which, with only a ratio of "lift" to "drift" of five to one in a properly constructed aerodrome, would support 325 pounds, or a weight greater than the Santos-Dumont No. 9 and its operator combined.

Sixteen feet per second is but little more than ten miles per hour.

More powerful machines, including the Spencer machine, of London, have accomplished not more than two or three times this speed.

A speed of twenty miles per hour is undoubtedly within the scope of the present commercial gasolene and other vapor motors by means of aeroplanes, and with improvement in the motor the "heavier-than-air" machines therefore commence about where balloons left off.

The first machine to fly—Professor Langley's—made a speed of about thirty miles per hour for the short time it was in the air.

When it is realized that twelve men are necessary to develop one horse-power by turning cranks, the failure of man to propel himself through the air by means of his own power is understood.

The extraordinary development of light and efficient gas and steam motors for automobiles in the last few years puts a new face on the problem of aerial locomotion.

A twenty-foot specimen of the Eddy type has a superficial area of about 200 square feet, and at a speed of twenty miles per hour should have a "lift" of something over 400 pounds.

With a ratio of but four to one "lift" to "drift" the engine and propeller of the Santos-Dumont, No. 9, could thus be depended upon to pull 260 pounds through the air at a speed of from twelve to twenty miles per hour.

IMPORTANCE OF NEW
STEAM TURBINES.

The new high-speed steam turbines now successfully competing with low-speed reciprocating engines for all classes of work offer untold possibilities in this connection.

There is an enormous field for the aerodrome in the transportation of mail and express matter alone.

A machine of sufficient capacity to carry one man at a speed of fifteen to twenty miles per hour will probably be made at a cost of something under $500.

The possibilities of the subject are too great for general appreciation.

A traffic line with no maintenance of way expenses is certainly ideal and must prove profitable.

MOST DENSELY POPULATED DISTRICT CONTAINS SIXTY THOUSAND PERSONS.

Section Bounded by the River, Sixteenth Street, Wash Street and Cass Avenue Provides Homes for One-Tenth of the Population of St. Louis.

Section of Foster Alley, where 350 Italians live.

WRITTEN FOR THE SUNDAY REPUBLIC.

Nearly one-tenth the population of St. Louis lives within an area 16 blocks long and five blocks wide. This section, which is identical with the Second Precinct of the Fourth Police District, is the most crowded section of St. Louis. It contains 65,000 persons, of all nationalities and speaking all languages.

Within this densely populated district is another district which contains 30,000 persons. This second district, which contains more families to the block than any other part of the city, is confined to the territory bounded on the south by Wash street, on the north by Cass avenue, on the east by Third street, and on the west by Eleventh street.

In this district, wealth is a curiosity, comforts are luxuries, and necessities are often unknown. Here, on the other hand, real estate men reap their largest profits. A small sum invested in tenement property returns big dividends. Owners of real estate in the slums do not spend much money on improvements.

MANY RACES REPRESENTED.

In the crowded district in the North End are found representatives of all the races of Europe—the lowest types of European citizenship that the Old World can dump on American shores. There also are found ex-convicts, the lowest types of saloon loafers, and the turbulent class of negroes.

The district also contains many of the hardest working citizens to be found in the country, thousands of virtuous women and hundreds of bright children.

The most cosmopolitan block in this crowded foreign section is that on Third street between O'Fallon and Ashley streets.

On the east side of this block is the Ashley building, the largest tenement in St. Louis. The lower floor of this tenement is used for business purposes, but the three upper floors, containing 270 rooms, are swarming with life.

In these three floors live 815 persons. Yet all the rooms in the building are not occupied. In the Ashley building are Polanders, Italians, Germans, Irish, Bohemians, Hungarians and Slavs.

Patrolman Wardenski, who walks the beat which includes the Ashley building, speaks seven languages.

FAMILIES OCCUPY ONE ROOM.

The families in this building occupy two or three rooms each. While many of the rooms have windows opening on the street or on a back porch, there are rooms in the interior of the building which have no outdoor windows. These rooms are lighted from the skylight or the hall light.

"Bed-Bug Row" is the name which has been given to Hardy's flats, on Fourteenth street, between O'Fallon street and Cass avenue. In these flats fifty families find accommodation, most of them occupying but one room. Many of the rooms are lighted with but one window, and the door, if it happens to be open. The police say that the class of people occupying these flats is higher than that which occupied them a year ago.

In the alley between Broadway and Sixth street and reaching from Carr street to O'Fallon street, a distance of two blocks live 350 Italians. This quarter is called "Foster alley."

CROWDED ROW OF FLATS.

On one side of the part of Foster alley extending from Carr street to Biddle street is a large stable, and on the other side is a row of two-story flats. On each floor of these flats are two rooms. Some of the families occupy both floors, thus having four rooms, while others only use two rooms.

When the occupants of these flats desire to get a breath of fresh air it is necessary for them to go into the alley, which is for them the street on which they live. Most of these Italians make their living by selling bananas and lemons.

In the alley east of Tenth street between Carr and Biddle streets is a two-story, five-room house which contains five families. Each family occupies one room.

In a tenement at the northeast corner of Eleventh and Carr streets live forty Jewish families. In the Monahan flats on Seventh street between O'Fallon and Carr streets are thirty families, or about 150 persons. In the Western House, at the corner of Carr and Third streets, 150 people sleep every night, while in the St. Louis House, at No. 1029 North Third street, 100 people lodge.

TWO-DECKED BUNKS.

One of the most crowded lodging-houses is known as the Maple House, at the corner of Third and Ashley streets. Here 150 persons sleep every night. About forty can find sleeping accommodations in small rooms, but the rest are given cots in large rooms. These rooms are furnished with double cots, one cot being placed above another, and both being attached to the same frame. In one room, reaching the entire length of the building, fifty men are accommodated every night.

"Tenth Street Yard" is the name given to two three-story tenements, separated by a small yard, on Tenth street between Wash and Biddle streets. There sixty negro families live. At least 350 negroes live on Twelfth street, between Wash and Biddle.

Both sides of O'Fallon street, from Broadway to Fourteenth street, are lined with tenements. Among the nationalities represented among the occupants of these houses are Poles, Scandinavians, Sicilians, Italians, Russian Jews and Irish. Many Russian Jews and Poles live on Seventh, Eighth and Ninth streets.

One of the most difficult problems with which the police of the Second Precinct have to deal is that of sanitation. "Much as we try," said Sergeant Dowdall of the Second Precinct, "we cannot keep the streets free from refuse.

"Children will throw watermelon rinds and banana peelings into the streets. It might be interesting to know that one of the alleys occupied by negroes is kept cleaner by the residents than is Foster alley, occupied by Italians. The Jews take no pride in cleanliness.

"Inevitably the conditions in which the people of this part of the city live produce a vast amount of vice. Many of the tenement dwellers have no idea of morality. But, on the other hand, many good men and women live in this section of the city.

"In this precinct are many ex-convicts. To-night I could go into some saloons here and round up twenty men who have criminal records.

POLICE KEPT BUSY.

"The police usually have all they can do on Saturday night. Many of the workingmen living here get their pay on Saturday and carouse Saturday night."

Life in the crowded section is not pleasant during the hot summer months. On hot nights the people come out on the fire escapes, on the back porches, into the alleys and on the sidewalks to find a cool place to sleep.

There are few places for children to play in the crowded section, and for this reason the children live in the street. Here again the police have their troubles. Many complain about the children congregating on the corners, but where else will they congregate?

"The small children must have some place to play," said Sergeant Dowdall, "and we must recognize that fact."

Saturday night is the gala night in the Second Precinct of the Fourth District, and Biddle Market is the gayest place. It is located between High and Thirteenth streets and extends from Biddle to O'Fallon streets. Here the men and women of the crowded section go Saturday night to buy their supplies for the week.

It must not be supposed that nothing attractive exists in the Second Precinct. Even in the blocks where the tenements are crowded most closely together are houses decorated with flowers, and in front of some of the houses are little flower gardens. These improvements have been largely brought about through the efforts of the Civic Improvement League.

ROOM IN THE MAPLE HOUSE.

This apartment contains twenty-five double cots, and fifty men sleep in it every night.